Lesson 5-3
Injuries to Muscles and Bones

Objectives

Objectives Legend

C=Cognitive P=Psychomotor A=Affective
1 = Knowledge level
2 = Application level
3 = Problem-solving level

Cognitive Objectives

At the completion of this lesson, the CFR student will be able to:

5-3.1 Review the components of the skeletal and muscular systems. (C-1)
5-3.2 List the emergency medical care for a patient with a painful, swollen, deformed extremity. (C-1)
5-3.3 Relate mechanism of injury to potential injuries of the head and spine. (C-3)
5-3.4 State the signs and symptoms of a potential spine injury. (C-1)
5-3.5 List the signs and symptoms of injury to the head. (C-1)
5-3.6 Describe the emergency medical care for injuries to the head. (C-1)

Affective Objectives

At the completion of this lesson, the CFR student will be able to:

5-3.7 Explain the rationale for the feeling of patients who have need for stabilization of the painful, swollen, deformed extremity. (A-3)
5-3.8 Demonstrate a caring attitude towards patients with a musculoskeletal injury who request emergency medical services. (A-3)

Psychomotor Objectives

At the completion of this lesson, the CFR student will be able to:

5-3.9 Demonstrate the emergency medical care of a patient with a painful, swollen, deformed extremity. (P-1, 2)
5-3.10 Demonstrate opening the airway in a patient with suspected spinal cord injury. (P-1, 2)
5-3.11 Demonstrate evaluating a responsive patient with a suspected spinal cord injury. (P-1, 2)
5-3.12 Demonstrate stabilizing of the cervical spine. (P-1, 2)

Preparation

Motivation:

Injuries to the bones and muscles are very common types of injuries encountered by the CFR. These injuries are largely non-life threatening in nature but may be very dramatic. Prompt identification and stabilization of

musculoskeletal injuries is crucial in reducing pain, preventing further injury and minimizing permanent damage.

Prerequisites:

Preparatory, Airway, Patient Assessment, and Circulation Modules

Materials

Utilize various audio-visual materials relating to emergency medical care. The continuous development of new audio-visual materials relating to EMS requires careful review to determine which best meet the needs of the program. Materials should be edited to ensure that the objectives of the curriculum are met.

EMS Equipment:

None required. Students should be taught how to stabilize, if needed, until trained EMS personnel arrive.

Primary Instructor:

One EMT-B Instructor knowledgeable in musculoskeletal and head and spinal injuries.

Suggested minimum time for completion

30 minutes

Presentation

Declarative (What)

I. Review of the Musculoskeletal system
  A. The Skeletal System
    1. Components
      a. Skull - houses and protects the brain
      b. Face
      c. Spinal Column
      d. Thorax
        (1) Ribs
        (2) Breastbone (sternum)
          (a) Xiphoid process - lowest portion of the sternum
          (b) Landmark for determining hand position for chest compressions
      e. Pelvis
      f. Lower extremities
        (1) Thigh (femur)
        (2) Knee cap (patella)
        (3) Shin (tibia and fibula)
        (4) Ankle
        (5) Feet
        (6) Toes
      g. Upper extremities
        (1) Shoulder (collar bone and shoulder blade)
        (2) Upper arm (humerus)
        (3) Forearm (radius and ulna)
        (4) Wrist
        (5) Hand
        (6) Fingers
      h. Joints - where bones connect to other bones
  B. The Muscular System
    1. Components
      a. Voluntary (skeletal)
        (1) Attached to the bones.
        (2) Under control of the nervous system and brain. Can be contracted and relaxed by the will of the individual.
        (3) Responsible for movement.
      b. Involuntary (smooth)
        (1) Found in the walls of the tubular structures of the gastrointestinal tract and urinary system.
        (2) Also in the blood vessels and bronchi.
      c. Cardiac
        (1) Found only in the heart.

(2) Can tolerate interruption of blood supply for only very short periods.

II. Injuries to Bones and Joints
- A. Mechanism of injury
  - 1. Direct force
  - 2. Indirect force
  - 3. Twisting force
- B. Bone or joint injuries
  - 1. Types
    - a. Open - break in the continuity of the skin
    - b. Closed - no break in the continuity of the skin
  - 2. Signs and symptoms
    - a. Deformity or angulation
    - b. Pain and tenderness
    - c. Grating
    - d. Swelling
    - e. Bruising (discoloration)
    - i. Exposed bone ends
    - j. Joint locked into position
  - 3. Emergency medical care of bone or joint injuries
    - a. Body substance isolation
    - b. After life threats have been controlled, allow patient to remain in a position of comfort
    - c. Application of cold pack to area of painful, swollen, deformed extremity to reduce swelling and pain
    - d. Manual extremity stabilization
      - (1) Support above and below an injury
      - (2) Cover open wounds with a sterile dressing.
      - (3) Pad to prevent pressure and discomfort to the patient.
      - (4) When in doubt, manually stabilize the injury
      - (5) Do not intentionally replace the protruding bones.

III. Injuries to the Spine
- A. Mechanism of injury
  - 1. Motor vehicle crashes
  - 2. Pedestrian - vehicle collisions
  - 3. Falls
  - 4. Blunt trauma
  - 5. Penetrating trauma to head, neck, or torso
  - 6. Motorcycle crashes
  - 7. Hangings
  - 8. Springboard or platform diving accidents
  - 9. Unresponsive trauma patients
- B. Signs and symptoms
  - 1. Tenderness in the area of injury
  - 2. Pain associated with moving
    - a. Do not ask the patient to move to try to find a pain response.

b. Do not move the patient to test for a pain response.

3. Pain independent of movement or palpation
   a. Along spinal column
   b. Lower legs
   c. May be intermittent
4. Soft tissue injuries associated with trauma
   a. Head and neck to cervical spine
   b. Shoulders, back or abdomen - thoracic, lumbar
   c. Lower extremities - lumbar, sacral
5. Numbness, weakness or tingling in the extremities
6. Loss of sensation or paralysis below the suspected level of injury
7. Loss of sensation or paralysis in the upper or lower extremities
8. Respiratory impairment
9. Loss of bladder and/or bowel control
10. Ability of the patient to walk, move extremities or feel sensation; lack of pain to spinal column does not rule out the possibility of spinal column or cord damage.

C. Assessing the potential spine injured patient
   1. Responsive patient
      a. Mechanism of injury
      b. Questions to ask
         (1) Does your neck or back hurt?
         (2) What happened?
         (3) Where does it hurt?
         (4) Can you move your hands and feet?
         (5) Can you feel me touching your fingers?
         (6) Can you feel me touching your toes?
   2. Unresponsive patient
      a. Maintain airway and breathing
      b. Stabilize head and neck manually in the position found
      c. Obtain information from others at the scene to determine mechanism of injury and patient mental status before the First Responder's arrival.

D. Complications
   1. Inadequate breathing effort
   2. Paralysis

E. Emergency medical care
   1. Body substance isolation
   2. Establish and maintain manual stabilization
      a. Maintain constant manual stabilization
      b. May be released when additional EMS resources have properly secured the patient to a backboard with the head stabilized.
   3. Perform initial assessment.
      a. Whenever possible, airway control should be done without moving the patient's head.
      b. Whenever possible, artificial ventilation should be done without moving the head.

4. Assess pulse, motor, and sensation in all extremities.

IV. Injuries to the Brain and Skull
   A. Head injuries
      1. Injuries to the scalp
         a. May bleed more than expected because of the large number of blood vessels in the scalp.
         b. Control bleeding with direct pressure.
      2. Injury to the brain - injury of brain tissue or bleeding inside the skull may increase pressure on the brain.
   B. Emergency medical care
      1. Body substance isolation
      2. Maintain airway/artificial ventilation/oxygenation.
      3. Initial assessment with manual spinal stabilization should be done on scene.
      4. Closely monitor the mental status for deterioration.
      5. Control bleeding.
         a. Apply enough pressure to control the bleeding, without disturbing the underlying tissue.
         b. Dress and bandage open wounds as indicated in the emergency medical care of soft tissue injuries.
      6. Be prepared for changes in patient condition.

Application

Procedural (How)

1. Show diagrams of the muscular system.
2. Show diagrams of the skeletal system.
3. Show audio-visual materials of signs of open and closed bone and joint injuries.
4. Demonstrate assessment of an injured extremity.
5. Demonstrate manual stabilization techniques.

Contextual (When, Where, Why)

Injuries to bones and joints require immediate stabilization, if the patient is not in a position of comfort, unless life-threatening injuries are present. If life threatening injuries are present, ignore extremity injuries and address the immediate problem.

Failure to stabilize a bone or joint injury can result in: damage to soft tissue, organs, nerves, muscles; increased bleeding associated with the injury; permanent damage or disability; conversion of a closed injury to an open injury; and an increase in pain.

Student Activities

Auditory (Hearing)

1. The student should hear simulations of various situations involving musculoskeletal injuries and the proper assessment and emergency medical care.

Visual (Seeing)

1. The student should see diagrams of the muscular system.
2. The student should see diagrams of the skeletal system.
3. The student should see audio-visual materials of open and closed bone and joint injuries.
4. The student should see a demonstration of an assessment of an injured extremity.
5. The student should see a demonstration of manual stabilization using general rules of stabilization.

Kinesthetic (Doing)

1. The student should practice assessment of an injured extremity.
2. The student should practice manual stabilization following the general rules of stabilization.

Instructor Activities

Facilitate discussion and supervise practice.
Reinforce student progress in cognitive, affective, and psychomotor domains.
Redirect students having difficulty with content. (Complete remediation form.)

Evaluation

Written:

Develop evaluation instruments, e.g., quizzes, oral reviews, and handouts, to determine if the students have met the cognitive and affective objectives of this lesson.

Practical:

Evaluate the actions of the CFR students during role play, practice, or other skill stations to determine their compliance with the cognitive and affective objectives and their mastery of the psychomotor objectives of this lesson.

Remediation

Identify students or groups of students who are having difficulty with this subject content. Complete remediation sheet from the instructor's course guide.

Enrichment

What is unique in the local area concerning this topic? Complete enrichment sheets from instructor's course guide and attach with lesson plan.